TOMOSYNTHESIS

AAPM SPRING CLINICAL MEETING
March 17, 2013

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Medical Director

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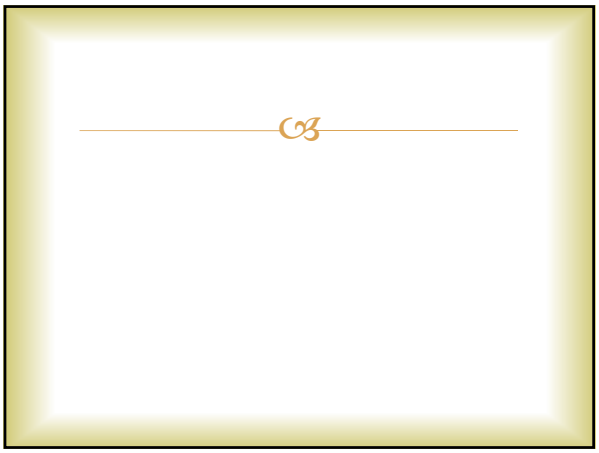
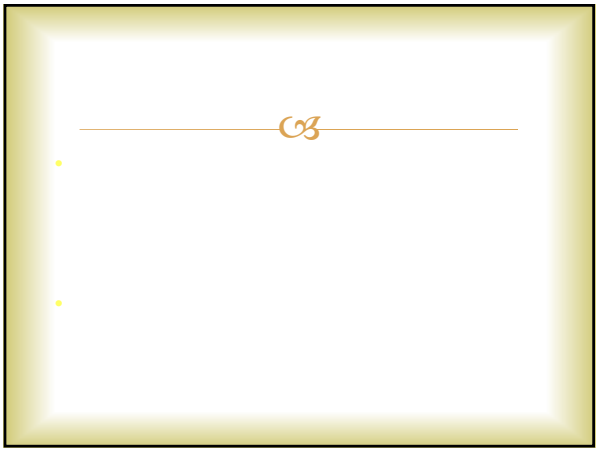
Breast Health & Research Center

Phoenix, AZ

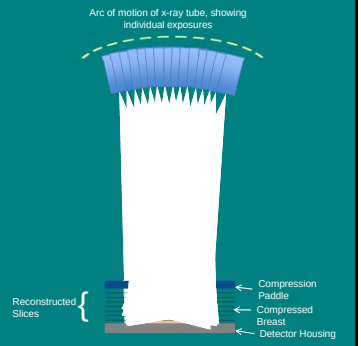


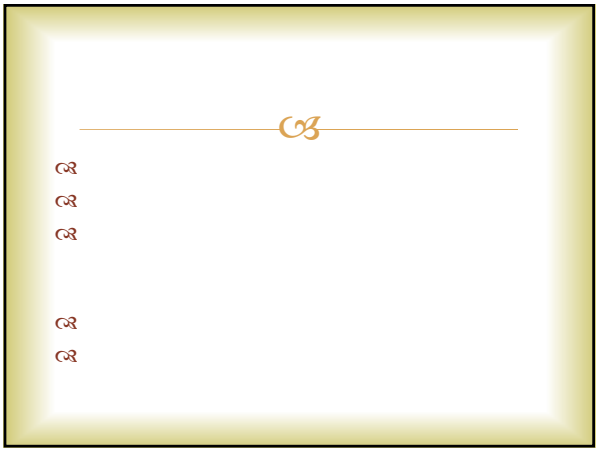


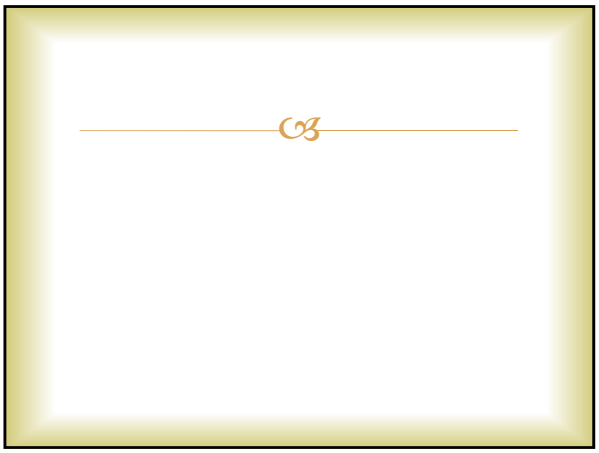

Selenia Dimensions

3D Principle of Operation

- X-ray tube moves in an arc across the breast
- A series of low dose images are acquired from different angles
- Total dose approximately the same as one 2D mammogram
- Projection images are reconstructed into 1 mm slices

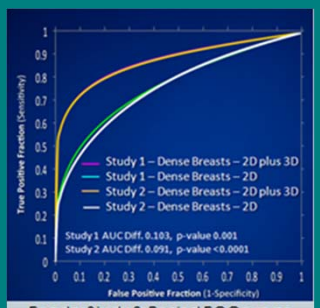




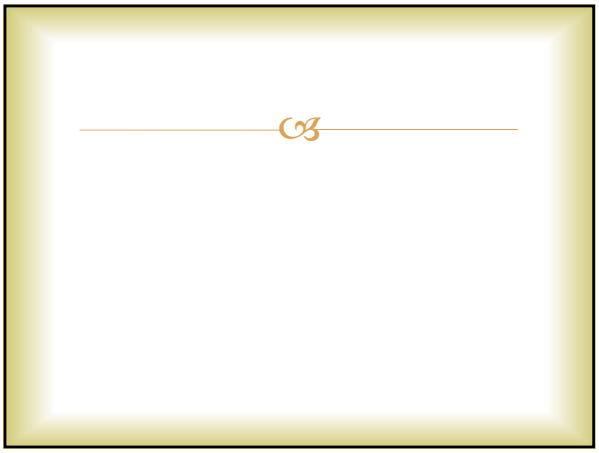


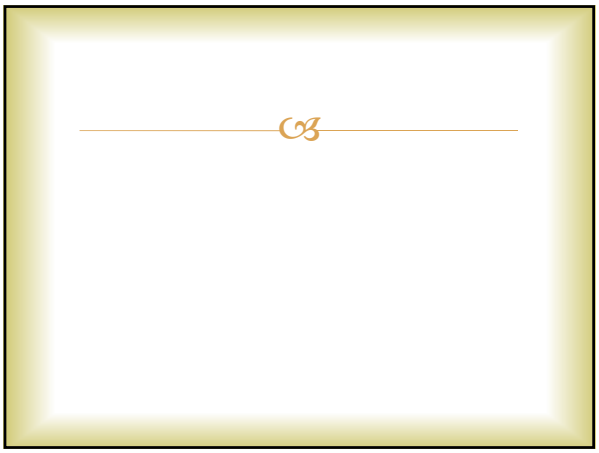
Why Dense Breasts

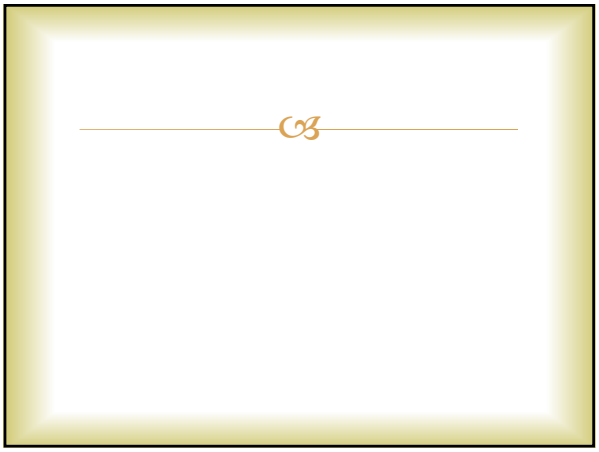
- Initially thought only significant benefit to dense breasts
- Later discovered benefit for fatty breasts as well



Reader Study 2: Pooled ROC curves for Dense Breasts



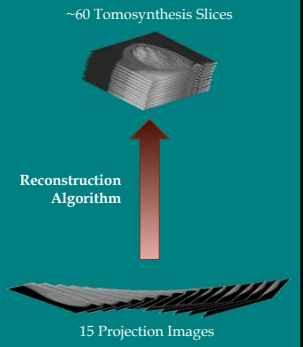




*C-view Synthesized 2D Image

How does it work?

- Perform a standard tomosynthesis scan (existing system)
- Reconstruct tomosynthesis slices (existing system)

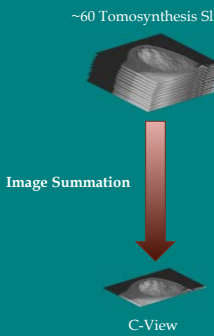


*Not approved for sale in the United States

C-view Synthesized 2D Image

How does it work?

- Perform a standard tomosynthesis scan (existing system)
- Reconstruct tomosynthesis slices (existing system)
- Synthesize 2D image (C-View)
  - Similar to Maximum Intensity Projection (MIP) as done with MRI images



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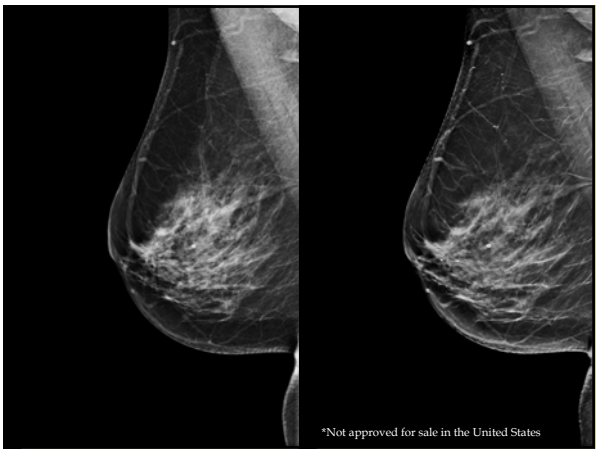
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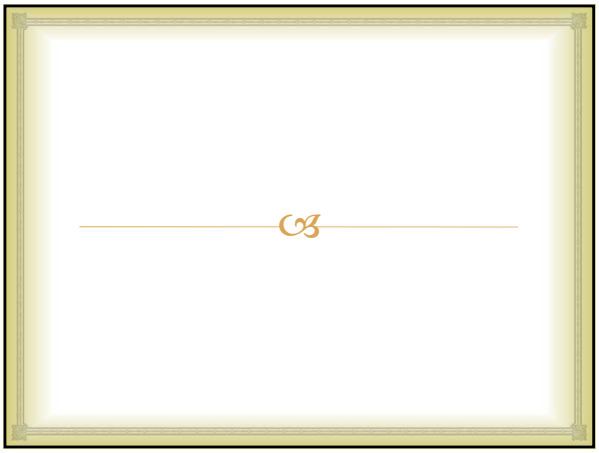
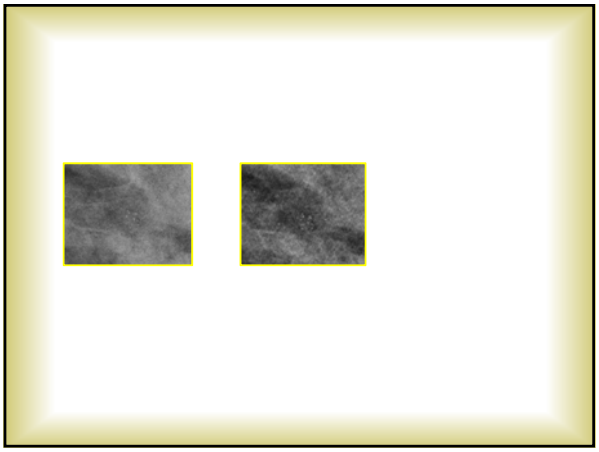
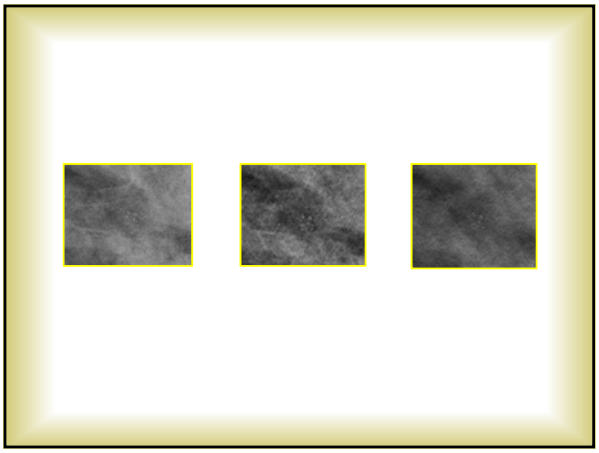
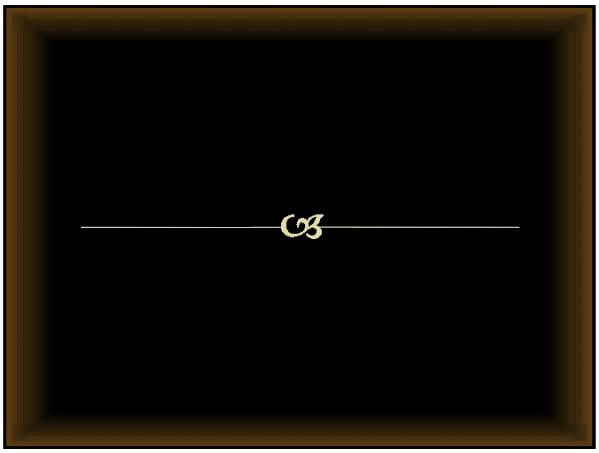
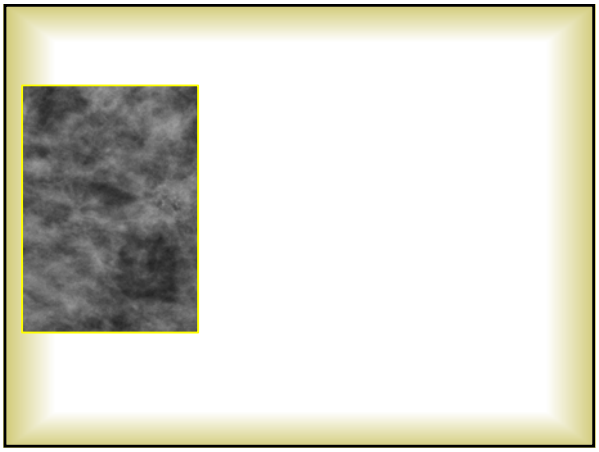
C-View
*Not approved for sale in the United States

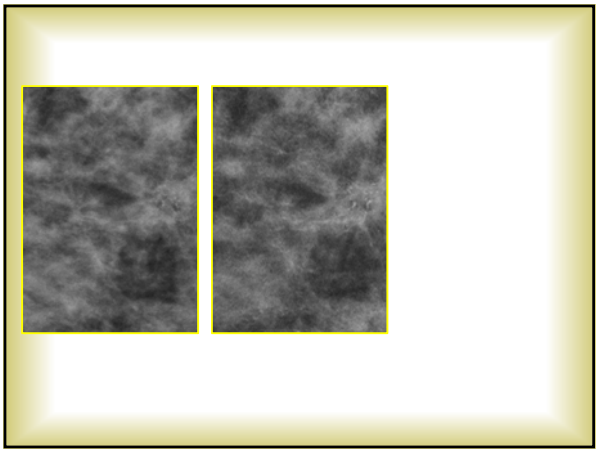


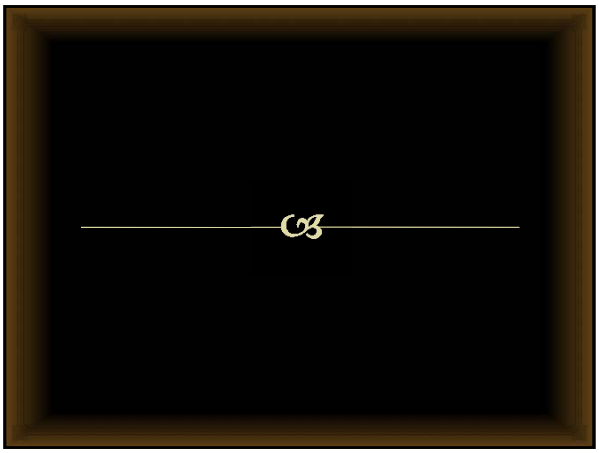


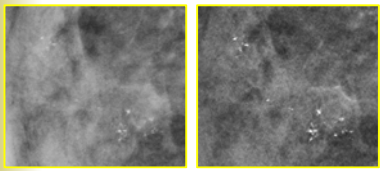






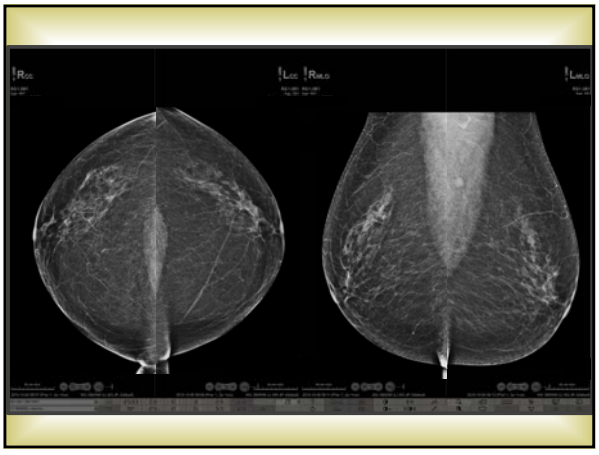


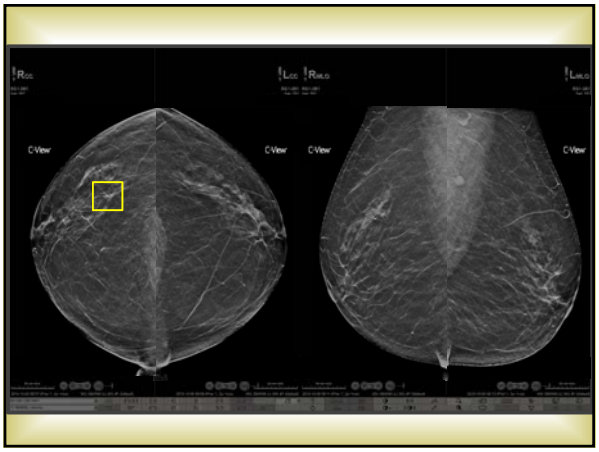


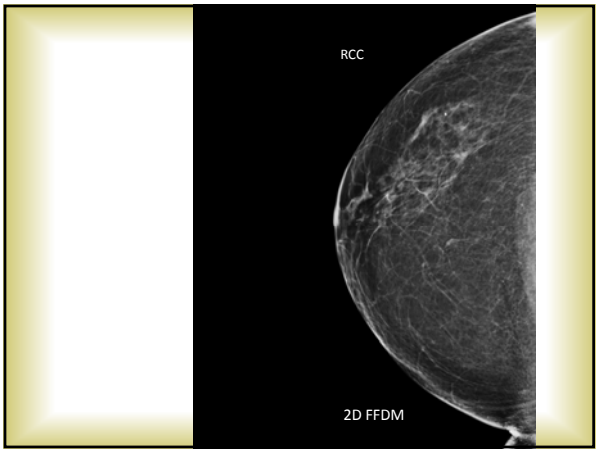


DISTORTIONS with C-VIEW

example



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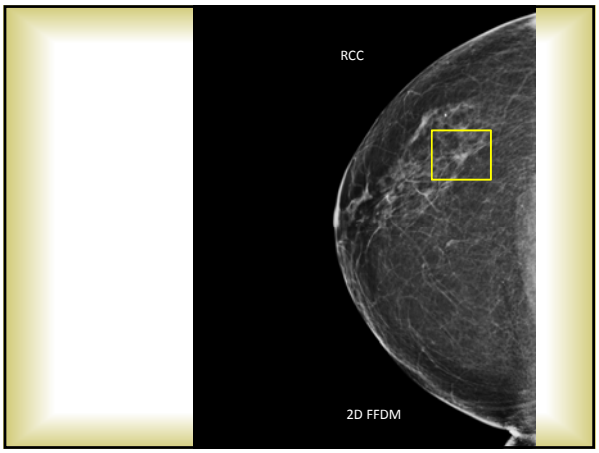
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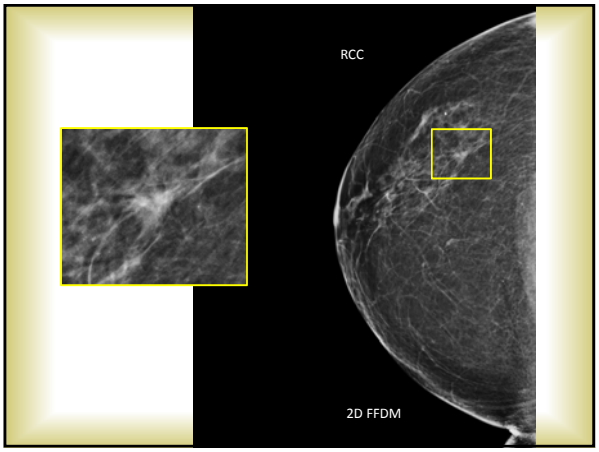
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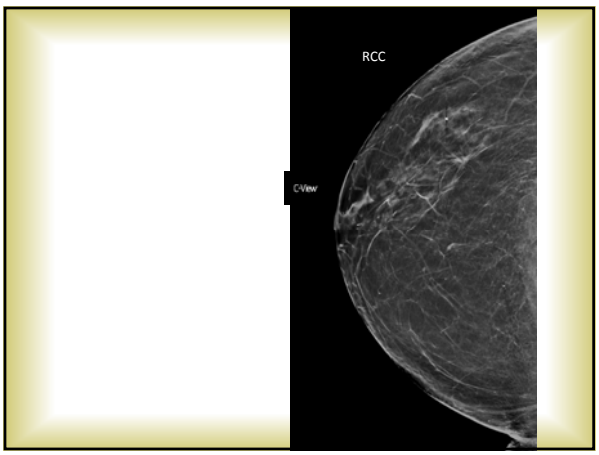
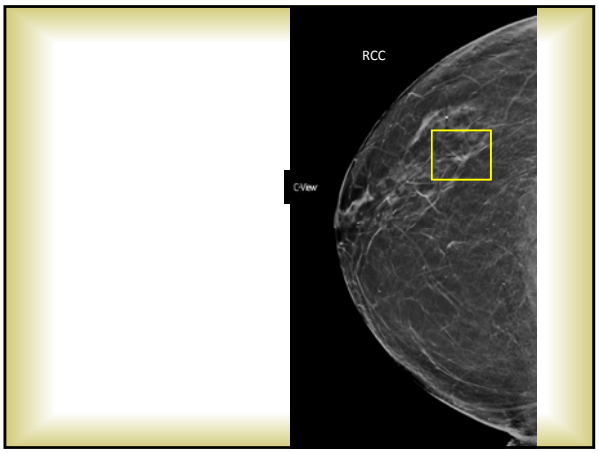

RCC
C-View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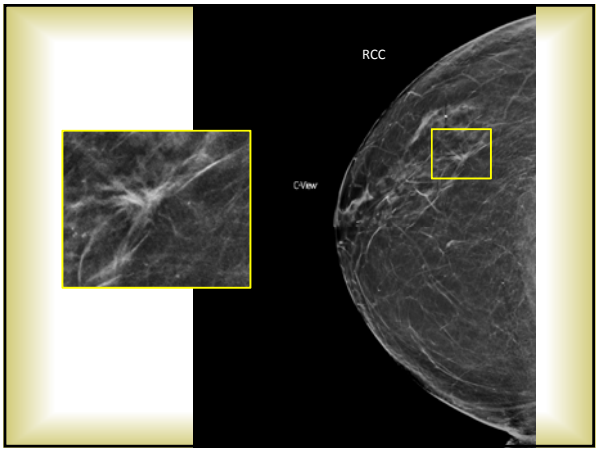
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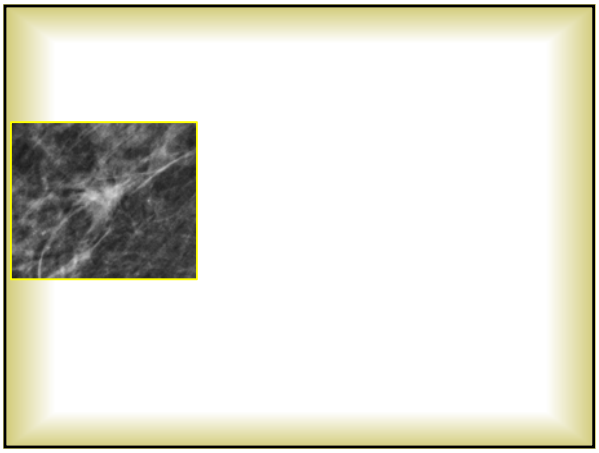
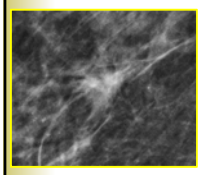
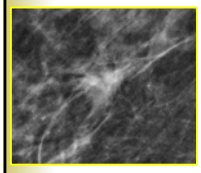


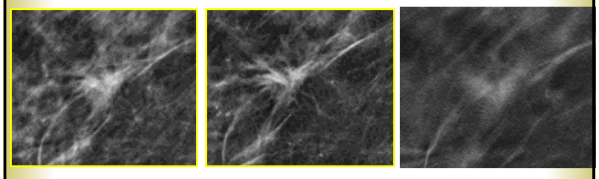


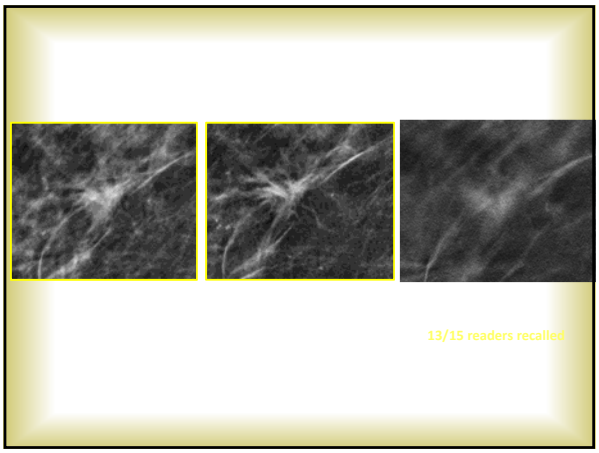
8/15 readers recalled

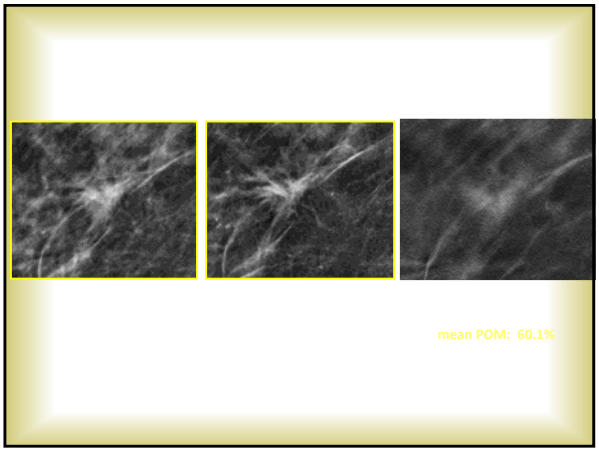


mean POM: 14.4%

(probability of malignancy)







Rationale for 3D plus *C-View

- The advantage of two-view tomosynthesis while reducing dose and capitalizing on the benefits of 3D
- Value of a 2-dimensional "summary" image:
  - Assessment of side to side symmetry
  - Assessment of interval change
  - Detection of calcifications
  - Recognition of the distributional aspect of features (particularly calcifications)

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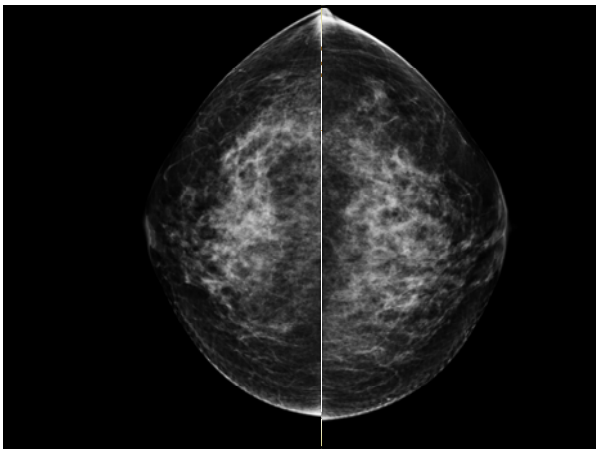

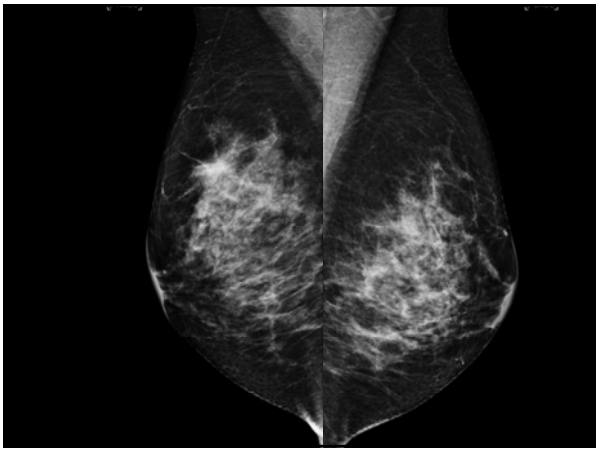

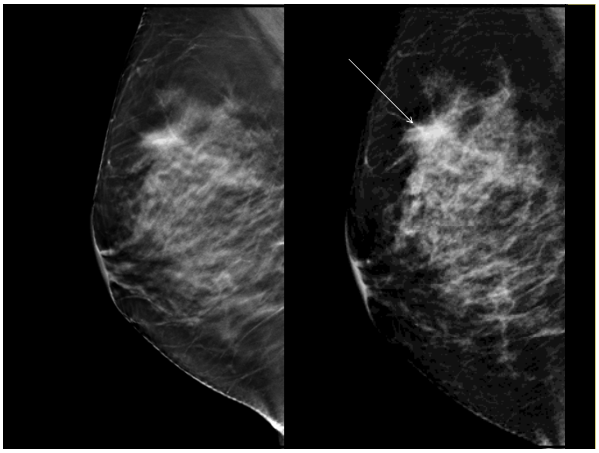

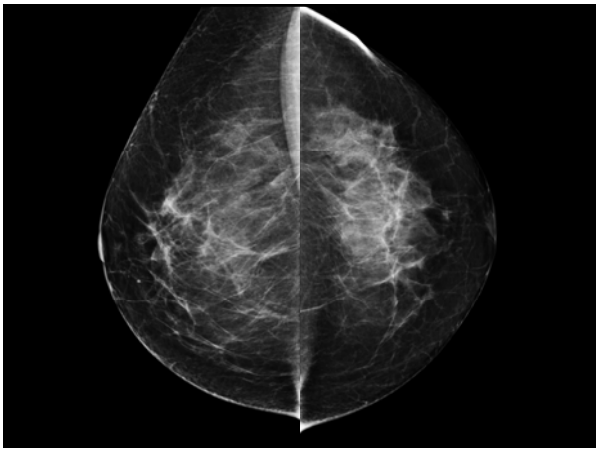

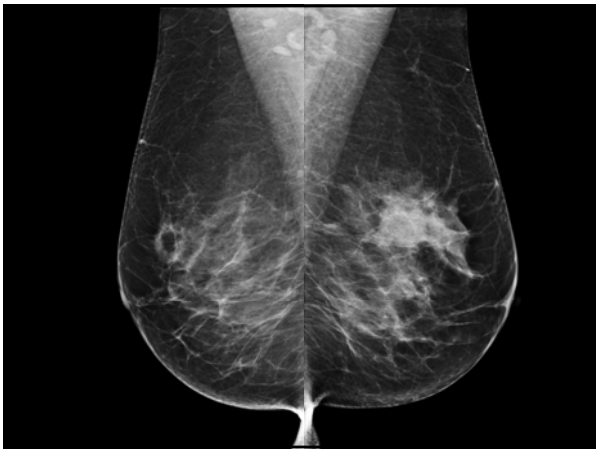

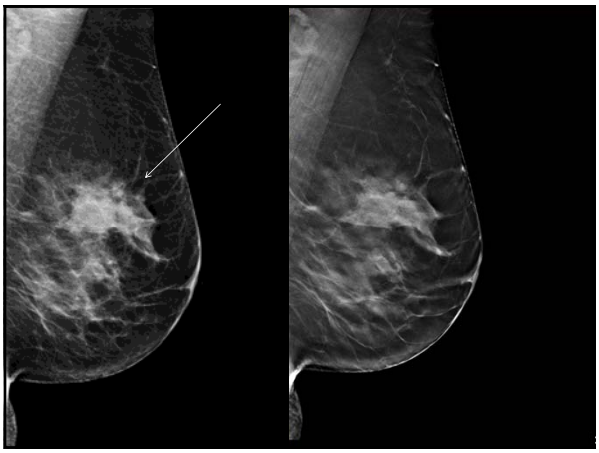

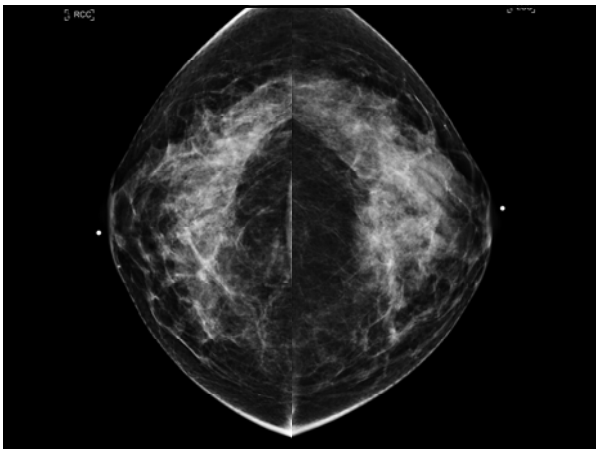
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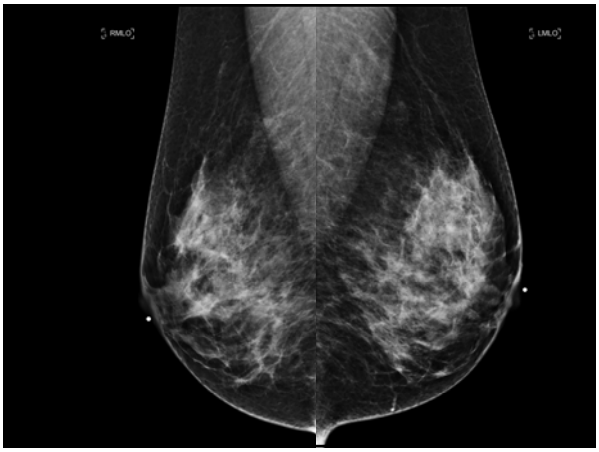
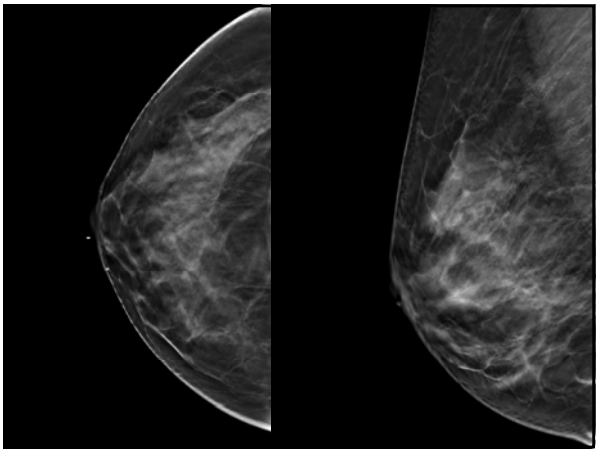
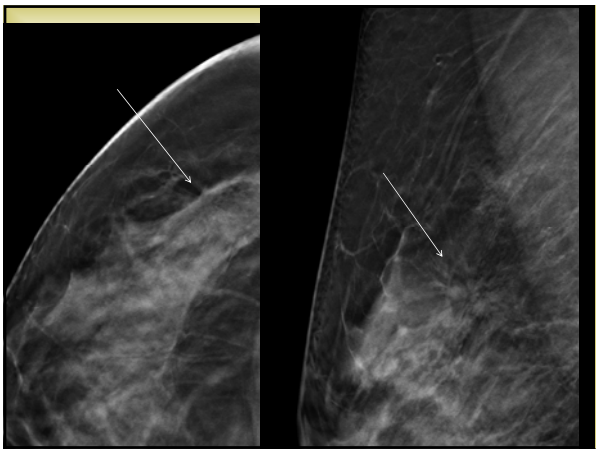
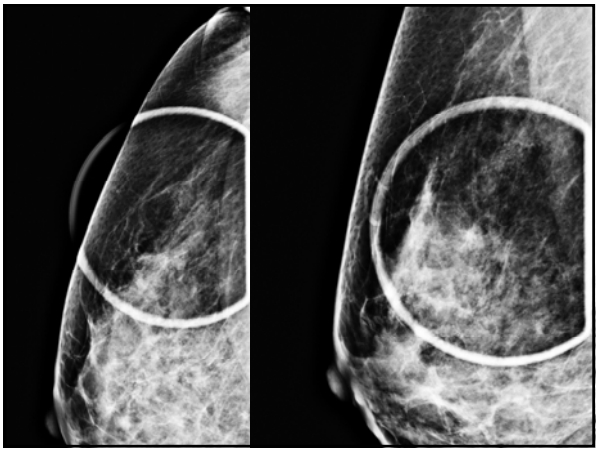
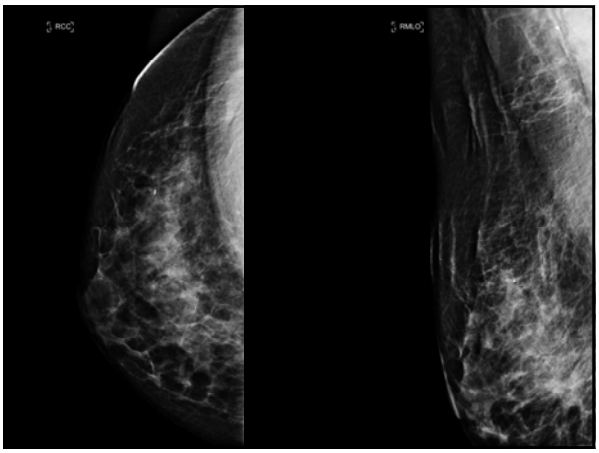

RMLO
LMLO








1 L 1.20 cm
RIGHT BREAST RADIAL 10 O'CLOCK
5 CM FN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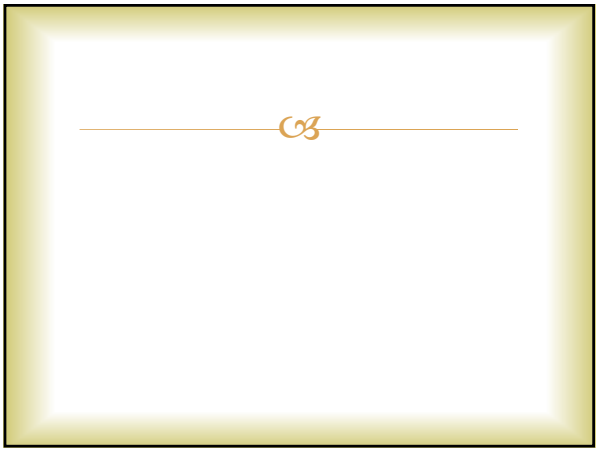
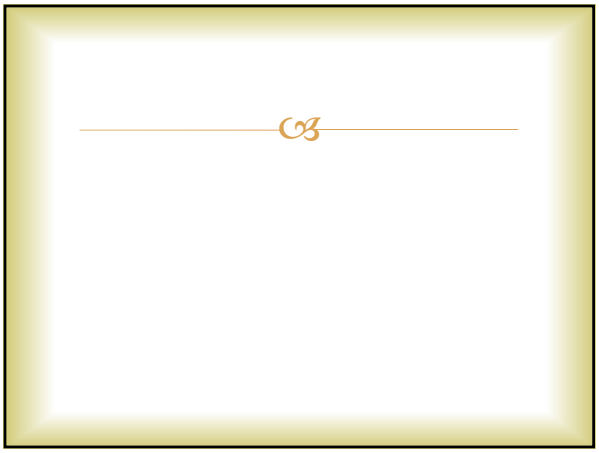
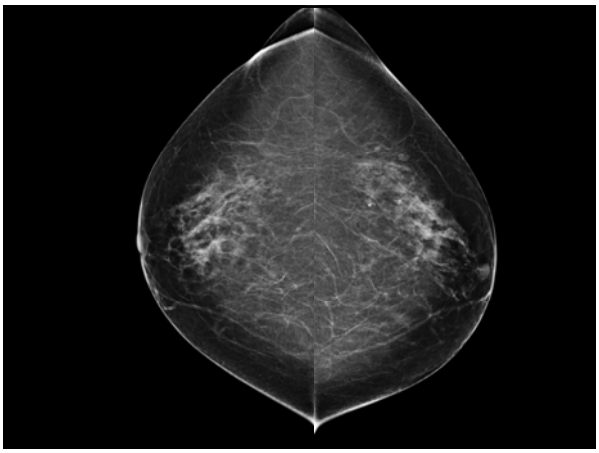
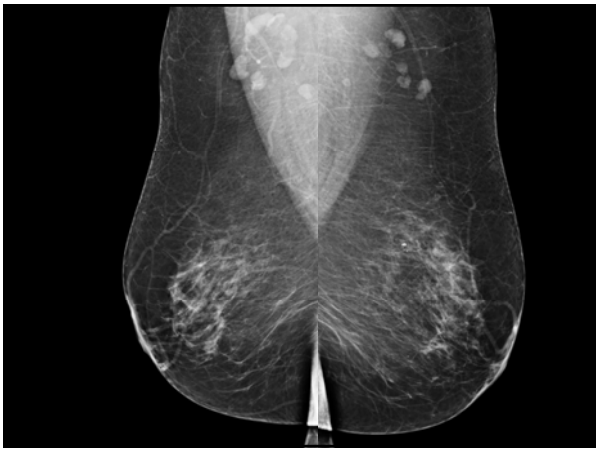
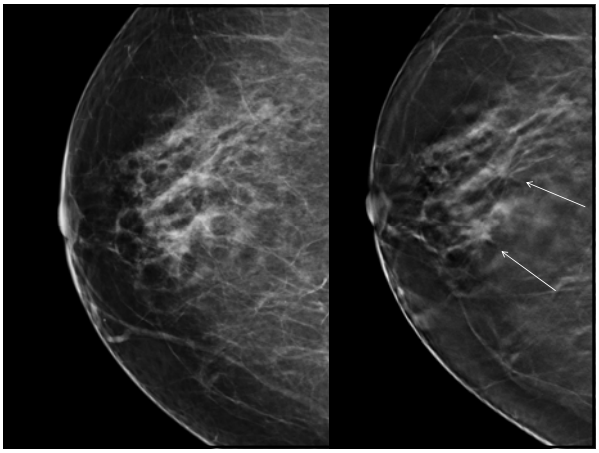
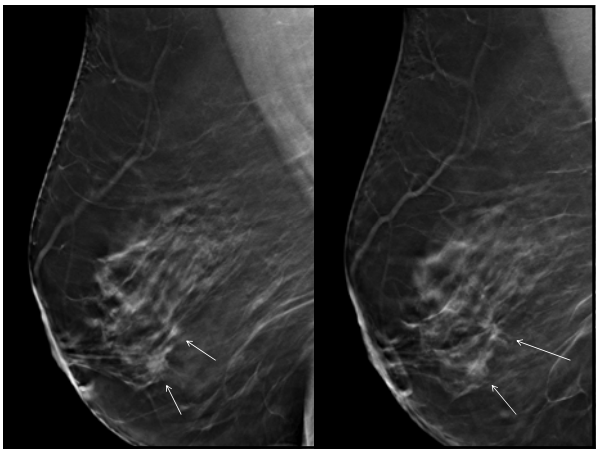


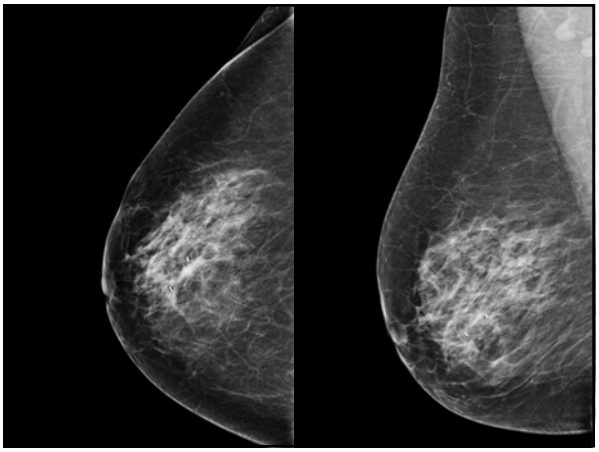


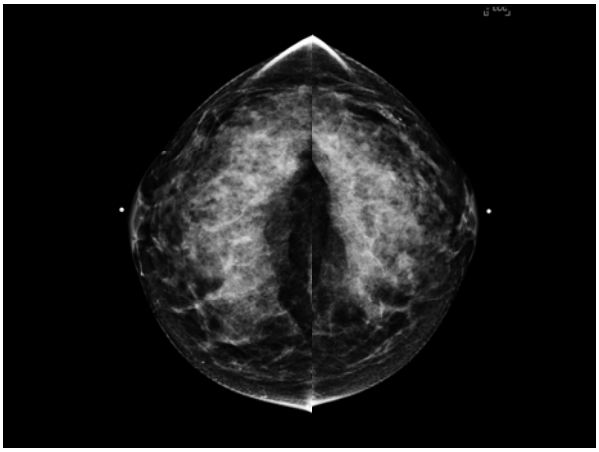


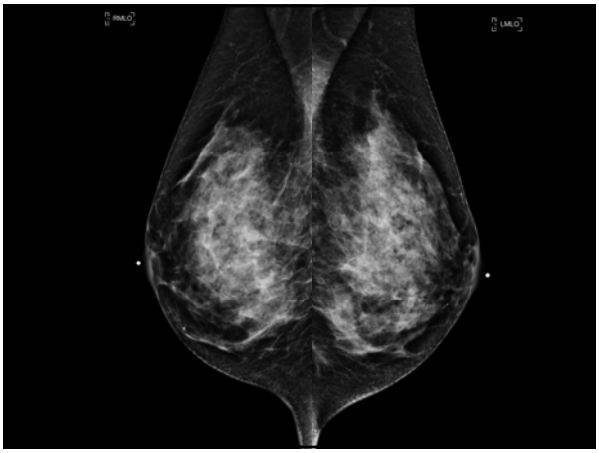


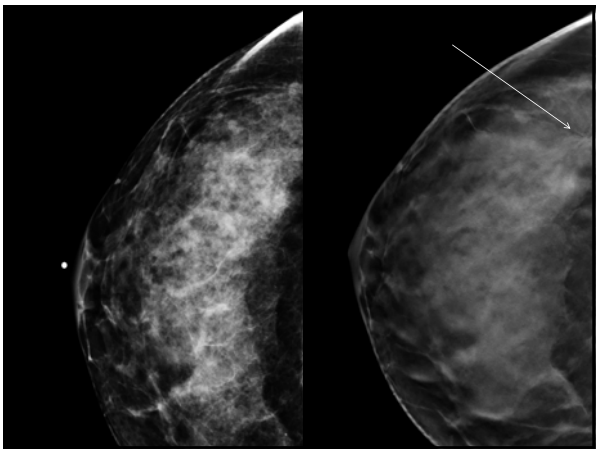


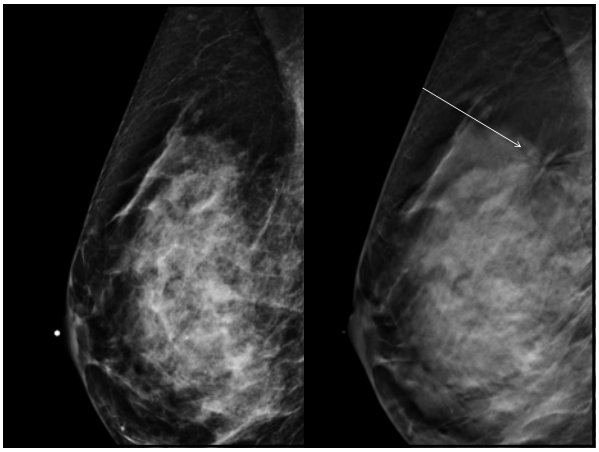


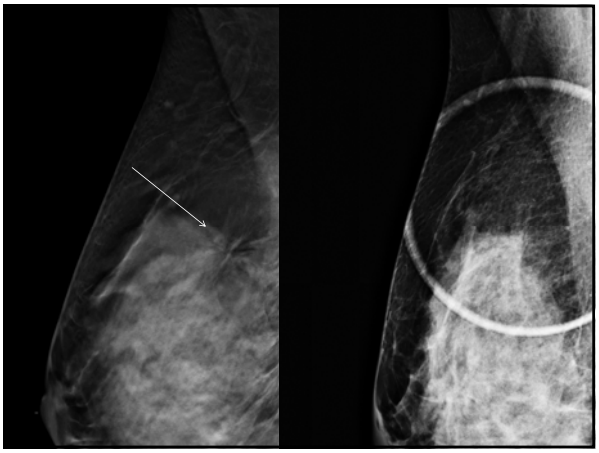


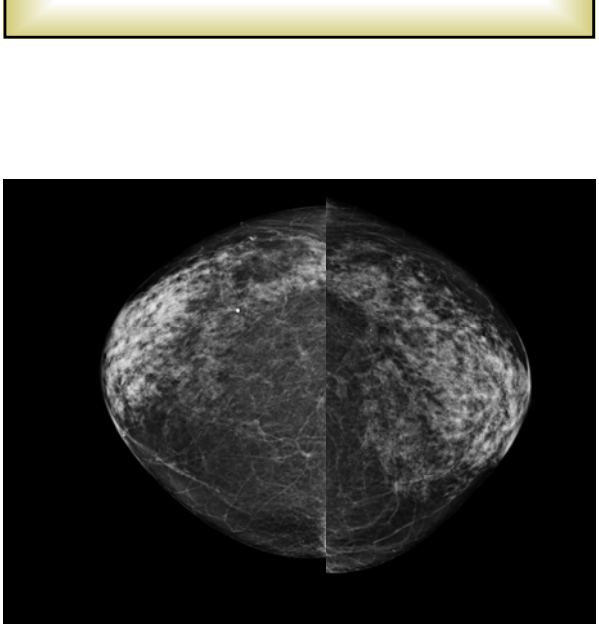


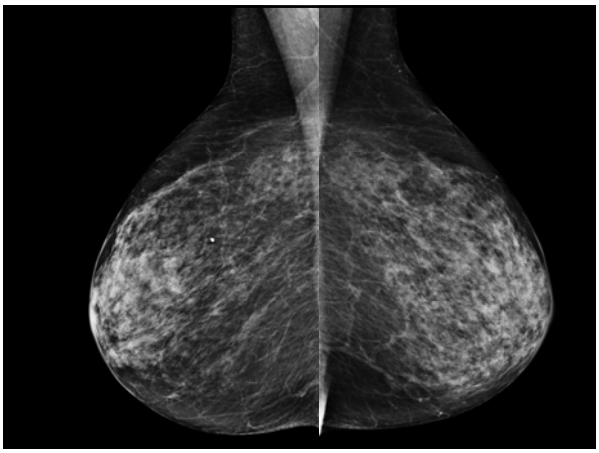


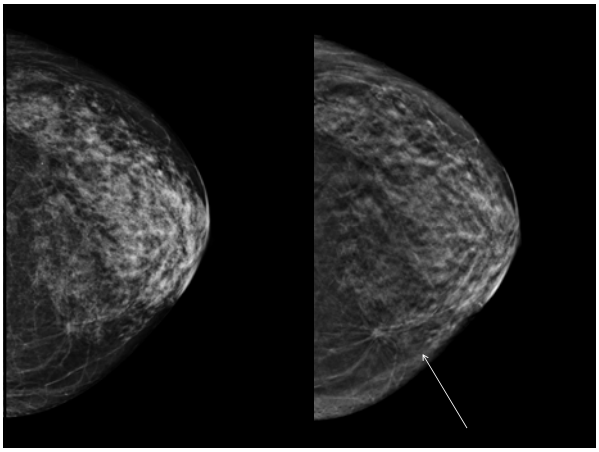


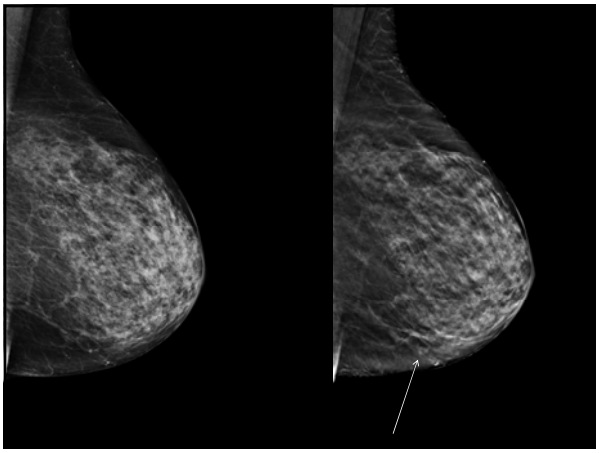


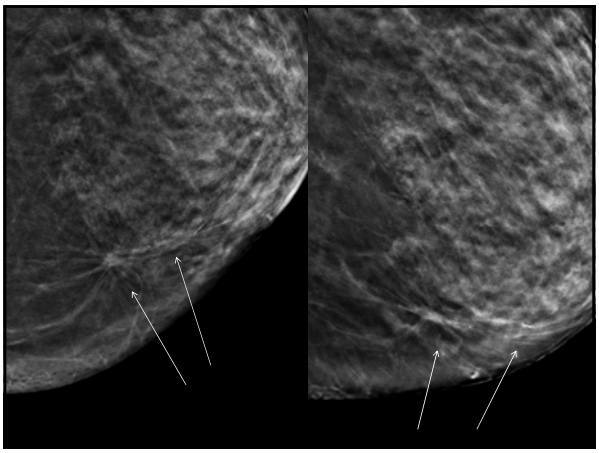


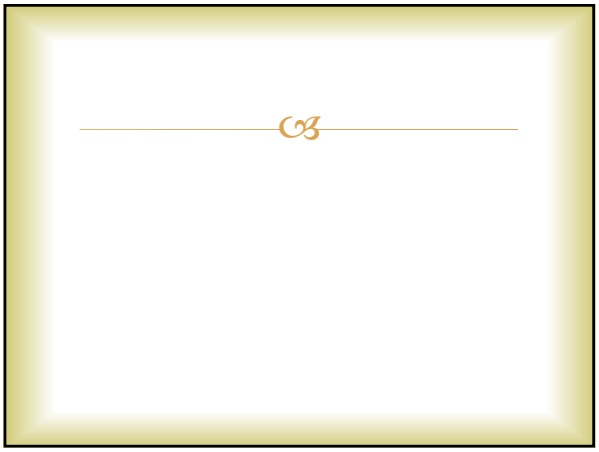


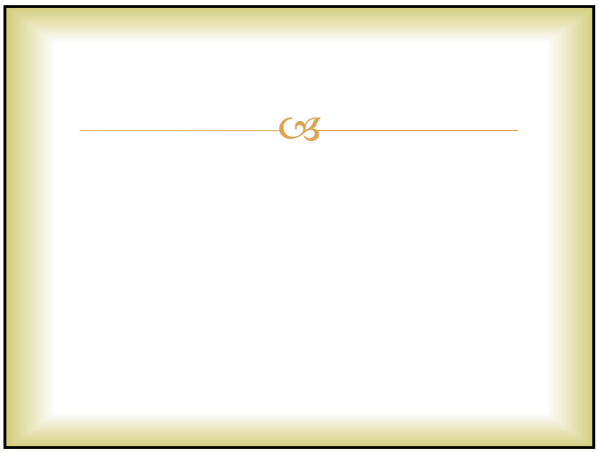


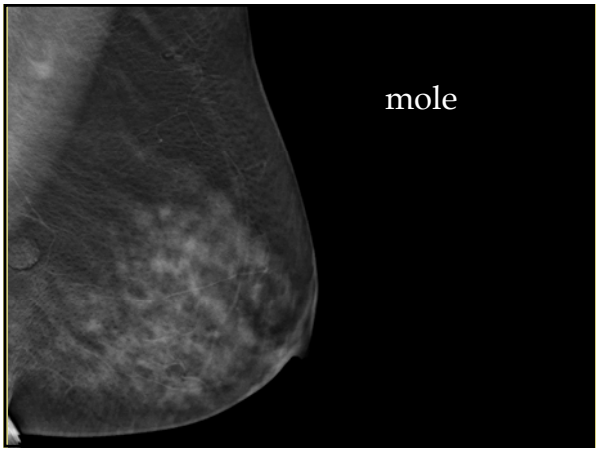


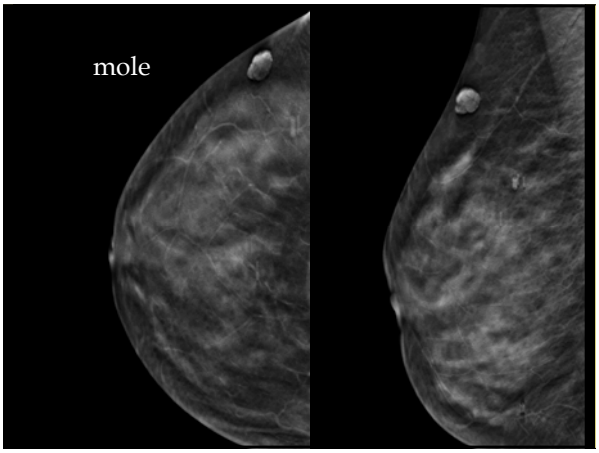









mole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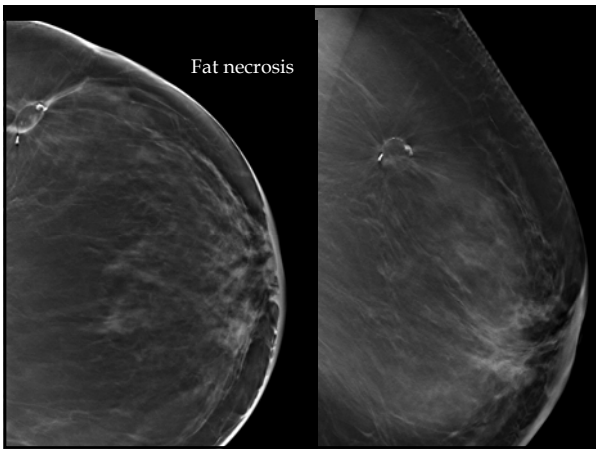
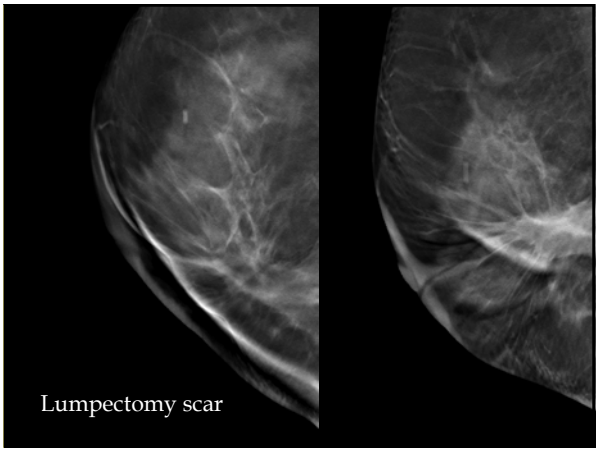
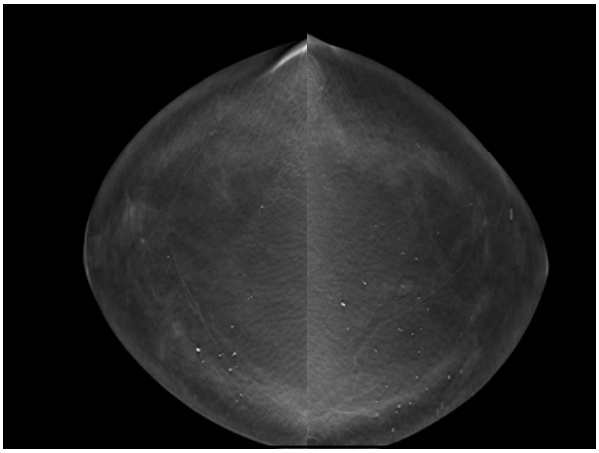
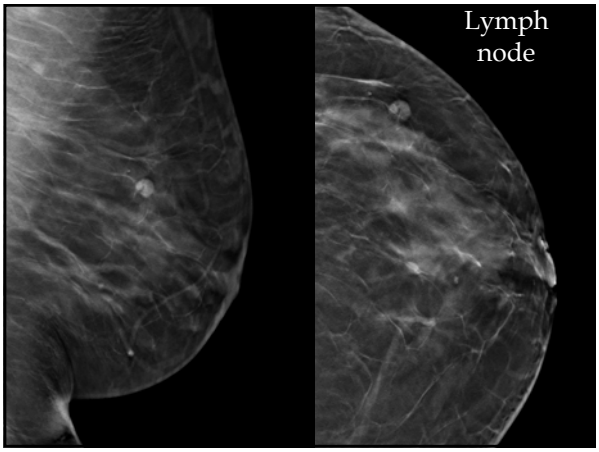
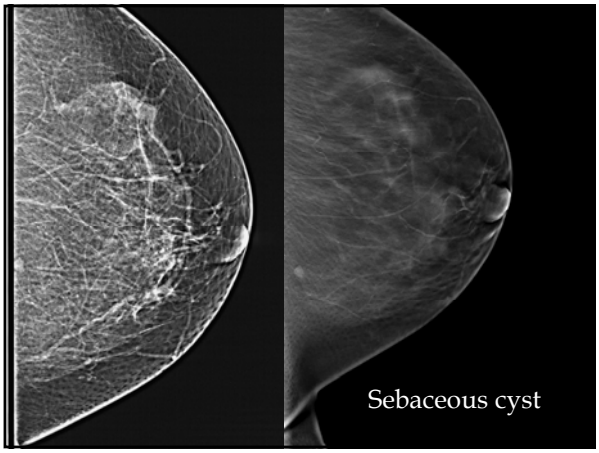

Fat necrosis

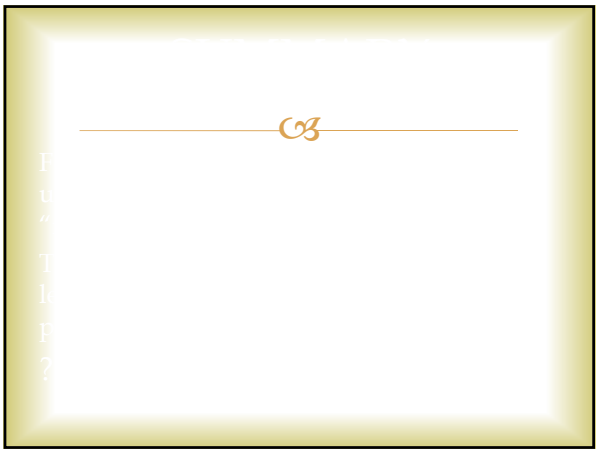

Lumpectomy scar

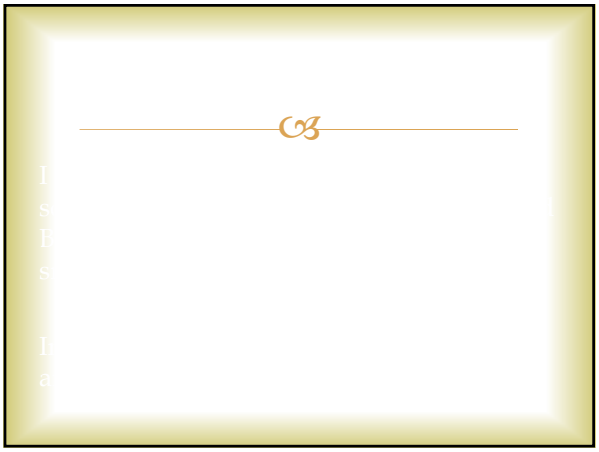



Skin calcs


Lymph
node


Sebaceous cyst






THANKS
FOR YOUR
ATTENTION

The radiation dose for combo mode (2D plus 3D) is:

0%
0%
0%
0%
0%

1. 1.45 mGy
2. 2.65 mGy
3. 4.85 mGy
4. 8.85 mGy
5. 10.65 mGy

10

ANSWER

2.65 mGy

http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/MedicalDevices/MedicalDevicesAdvisoryCommittee/RadiologicalDevicesPanel/UCM226757.pdf

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One of the major benefits of 3D imaging is:

0%
0%
0%
0%
0%

1. Lower radiation dose per case
2. Better visualization of calcifications
3. Less compression
4. Elimination of superimposed normal tissues
5. Easier positioning

10

ANSWER

Elimination of superimposed normal tissues

Kopans. Breast Imaging, 3rd edition. Lippincott Williams and Wilkins

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The one thing that C-View would NOT be helpful for would be:

0% 1. Decreased radiation dose by about 50%
0% 2. Better visualization of smooth/benign masses
0%
0% 3. Accentuation of distortions and calcifications
0% 4. Comparison to prior 2D exams
5. Guide for viewing the 3D image set

ANSWER

Better visualization of smooth/benign masses

http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/MedicalDevices/MedicalDevicesAdvisoryCommittee/RadiologicalDevicesPanel/UCM325901.pdf

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The major findings of the Oslo study regarding 2D imaging vs 2D plus 3D imaging for screening were:

0%
0% 1. There were no advantages to including 3D imaging in their population
0% 2. There was a 40% increase in the invasive cancer detection rate
0% 3. The detection rate for noninvasive cancers fell by 10%
4. 3D imaging was only helpful in denser breasts
5. The call back rate for additional imaging increased, due to better visualization, by 25%

10

ANSWER

There was a 40% increase in the invasive cancer detection rate

- Comparison of Digital Mammography Alone and Digital Mammography Plus Tomosynthesis in a Population-based Screening Program. Skaane P, Bandos AI, Gullien R, et al. Radiology, 2013 Jan 7. [Epub ahead of print]

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What is the one thing we have NOT FOUND since tomosynthesis was introduced:

0% 1. Decreased call back rate for additional mammographic imaging by about 40%
0% 2. More BR3 (probably benign) results
0% 3. Increased cancer detection rate (40% for invasive cancers, by Oslo study)
0% 4. Stable call back rate for ultrasound examinations
5. Increased positive predictive value for biopsies of about 35%

10

ANSWER

More BR3 (probably benign) results

- Rose S, Bujnoch L, O'Toole M, Nordmann A, Sexton R, Willison K, Tidwell A. Breast Tomosynthesis and Digital Mammography for Breast Cancer Screening: Medical Outcomes Audit. Presented at RSNA 2012, VSBR41-06 Breast Series: Emerging Technologies in Breast Imaging

- Comparison of Digital Mammography Alone and Digital Mammography Plus Tomosynthesis in a Population-based Screening Program. Skaane P, Bandos AI, Gullien R, et al. Radiology, 2013 Jan 7. [Epub ahead of print]

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